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Raw Products Research Activities

Western Washington Station Studies of Crop Improvement West of Cascades

The work of the Western Washington Experiment Station at Puyallup is directed to crop improvement and protection in the regions west of the Cascades. The following paragraphs from the Station's latest report show how closely its research is related to the fruit and vegetable crops grown largely for canning.

Cherry Fruit Worm in Western Washington

The cherry fruit worm overwinters as a mature larva, the first moths appearing in late May. Moths continue to issue over a period of several weeks and eggs are laid from the latter part of May through June, necessitating the application of several cover sprays at intervals of approximately two weeks for the control of the insect.

A number of sprays were applied June 4-5 and June 17-18 for the purpose of determining the efficacy of the control program. Only two applications were made since it was desirable to determine the efficacy of the two-spray program.

Cryolite and phenothiazine again gave the best results in the order named, basic lead arsenate and derris holding third and fourth places, respectively. These results substantiate those obtained in previous years. They indicate, moreover, that two cover sprays are the least on which the grower can depend for satisfactory control of the cherry fruit worm. Counts made in the remainder of the orchard, which was not sprayed until a rather late date, and then only once, indicate the danger from relying on one cover spray, while counts made in another orchard indicate the effectiveness of a more elaborate spray program than that followed experimentally. As a means for determining the degree of infestation arising from total neglect, counts were made in an abandoned orchard located within a short distance of the experimental plot. There the infestation was nearly 23 per cent.

Raspberry Breeding for Disease Resistance

Hybridization of red raspberries is being continued to produce an early variety similar to Tahoma in yield, fruit characters and disease resistance, and sweeter than that variety. A superior fall-bearing variety is also desired.

First reports were received from commercial growers of the Washington and Tahoma varieties originated in this project. Authentic reports of five tons per acre of Washingtons in the first crop year in the Puyallup Valley indicate that this variety is more productive than any previously grown here. Prices received by growers in most instances were equal to those received for the Cuthbert variety. There was considerable new planting of the Washington variety, including approximately 50 acres in Whatcom County where red raspberry growing was abandoned several years ago because of extensive winter injury to the Cuthbert variety.

The first evidence of disease susceptibility of the Washington variety was observed in Whatcom County. The disease has the appearance of anthracnose.

Fertilizers for Freezing and Canning Peas

The production of peas for canning and freezing already is a large industry and is increasing in importance as an agricultural enterprise in western Washington. The Experiment Station is continuing its work to determine the adaptability of western Washington soils for the production of this crop, the fertilizer requirements, proper fertilizer placement, the relative value of the several phosphate carriers, and proper soil management for the efficient production of peas.

The results of fertilizer placement plots may be summarized as follows: Placement of the fertilizer ½ inch to the side of, and ½ inch below the seed was decidedly superior to placement of the fertilizer with the seed in the furrow, placement directly above the seed, pre-drilling the fertilizer or placing it 1½ or 2½ inches to the side of the seed. The poorest results were obtained when the fertilizer was placed directly above the seed. When moderate quantities of phosphate fertilizers were used there was apparently little advantage in pre-drilling over placement directly with the seed. Placement of the material ½ inch to the side of the seed was superior to either of these placements. When nitrogen or potash or both were included in the fertilizer, pre-drilling was generally superior to placement directly with the seed but inferior to the placement ½ inch to the side. The application of these soluble materials close to the seed brought about a reduction in stand of plants and in some instances resulted in yields below that of the check plots.

The smallest increase over the check plots obtained the past season from the use of commercial fertilizer placed ½ inch to the side of the seed was 518 pounds of peas per acre and the greatest was over a ton per acre.

Inoculation Studies with Freezing and Canning Peas

The use of bulk inoculum composed of a mixture of either one or two one-acre cans of a commercial inoculant (moist peat) and 100 pounds of Lauren sandy loam resulted in an increase of 303 pounds of Thomas Laxton peas per acre on the Buckley loam plots. The response on the Buckley soil confirms tests made the past two years. It is recommended that inoculation be generally adopted for plantings on this soil. In addition to the increased yield

of peas a striking increase in the yield of vines was obtained. Since most of the peas are grown on dairy farms which use the vines for feed, any increase in forage production is of considerable value.

At Mt. Vernon an increase of 291 pounds per acre was obtained as a result of inoculation. The plots were located on soil that carried considerable quantities of salts usually found on tide-land soils. Only a few nodules were present on the roots of pea plants grown on the uninoculated strips. Even with the use of bulk inoculum, nodulation was not as heavy as on peas grown in certain other soils. Further study will be made as to the influence of other bulking materials which may be better suited to the particular conditions encountered in this soil.

No increase in yield was obtained from inoculation of peas planted in Monroe silt loam at Puyallup or Kent. Peas growing on these soils had an abundance of nodules on the roots even on the uninoculated plots, indicating that on certain soils these organisms may survive for a considerable period of time.

Since it is impossible to inoculate directly seeds that have been treated with the usual mercury and/or copper fungicides, this bulk inoculum was applied through the fertilizer distributor into the furrow with the seed. On soils in which uninoculated peas had only a few nodules on the roots good inoculation was obtained by this method. The use of bulk inoculation generally resulted in a heavier load of nodules on the roots and a wider distribution of nodules over the root system than did inoculum applied directly to the seed in the usual manner.

Surveys to determine the nodulation of peas in all of the important growing areas are being continued.

Pot culture and field studies are under way with the new fungicide Spergon which is apparently selective in action toward fungi and bacteria. In pot tests good nodulation of pea roots was secured by treating Spergon-treated seed with the commercial moist peat inoculant. If this material should prove effective, it would not be necessary to apply the inoculum by the bulking method. Until this method has been proved it is recommended that the bulk inoculum be used in those areas where nodulation of peas has been poor and in fields on which peas are being planted for the first time.

Sweet corn varieties

Trials of various hybrids of interest to growers of market, freezing and canning corn were continued. In the extra early season Spancross (C4.13) and Seneca 60 gave the highest number of marketable ears and these hybrids are recommended for trial by market gardeners and home gardeners. For second early, Seneca Golden is suggested, while Carmelcross looks promising in mid-season and Golden Cross and Ioana are recommended to finish the season. Freezers and canners should be interested in Carmelcross, Golden Cross and Ioana.

Potash deficiency of blue lake beans

In a general soil fertility study on Tower clay loam (Clark County) serious deficiency symptoms appeared on Blue Lake beans. Soil tests, leaf analyses, and fertilizer studies proved conclusively that the disorder could be attributed to potash deficiency. The healthy leaves contained over three and one-half times as much potassium as the leaves from the deficient plants.

In contrast to the normal green color of the healthy bean plant, those growing on the potash deficient soils are severely dwarfed and yellow in color. The first leaf symptom is a slight yellowing and loss of green color of the margins of the leaves at the greatest distance from the petiole and main veins. This loss of color continues and is soon followed by a browning of the tips of the leaves which is in turn followed by a browning of the leaf margins. The central and lower part of the leaf nearest to the main central vein remains green longest. A necrosis of the margins and occasionally of isolated interveinal areas follows. In severe cases terminal growth of the plant may stop after the plant is 8 to 12 inches tall. Branching appears to be profuse because of stoppage of terminal growth in later stages of development. Leaves and petioles of severely affected plants are brittle when compared to normal plants. Leaves, instead of being flat as in normal plants, are dwarfed and cup downward. Yellowing of such leaves is severe as is necrosis of marginal areas.

Applications of 100 pounds of 60 per cent muriate of potash per acre prevented the development of the symptoms described, and resulted in the recovery of the plants showing the deficiency symptoms when the applications were made in the earlier stages of the growth of the plant. New growth on such plants appeared normal in every respect.

Reference: Report of Agricultural Research and Other Activities of the Western Washington Experiment Station, Puyallup, for the fiscal year ended March 31, 1941.

Annual Purdue Report Reveals Wealth of Tomato Improvement Work in Indiana

The report of the Director of the Purdue University Agricultural Experiment Station for the year ending June 30, 1941, was published recently under the title "Research Solves Farm Problems." The work of this station in tomato improvement has been applied to advantage for many years by canners and growers of this important canning crop. The station has made many other contributions to the welfare of canning crops agriculture and some of the results noted in the latest annual report are included in the following paragraphs.

Breeding tomatoes for fusarium wilt resistance

A backcross program to incorporate resistance to fusarium wilt from a wilt "immune" strain of red currant tomato (Missouri strain 160) into the Baltimore and Rutgers varieties is in the sixth backcross generation. Selfed seed has been saved from plants that approach the commercial types after the third to fifth backcross. A relatively extensive acreage has been set with plants from this seed, from which plants of desirable fruit and vine types will be selected.

Resistance to defoliation diseases

Additional tests have been made of the reaction of about 40 tomato accessions to septoria and to early blight and individual plants showing some degree of resistance have been propagated for further use in the breeding program. Crosses between commercial varieties and certain of these accessions have been made.

Plant bug injury to tomatoes

An unusual type of injury to ripening tomato fruits was reported by tomato canners in August, 1940. Slightly sunken, pale areas, ranging from a ¼ inch to 1 inch in size, were found on the surface of the fruit. The flesh beneath these areas was also discolored and hardened.

Two common stink bugs were observed in large numbers puncturing the fruits. Laboratory studies with the two insects reproduced the typical injury.

Tomato seed production

The Indiana Baltimore tomato seed project has been carried on again in cooperation with the Indiana Canners Association. The variety was multiplied and about 300 pounds of seed were produced for use by the canners. This seed is used by the canners each year to grow plants for one of their factories, and they in turn produce seed to sell to other canners and tomato growers in general.

Twenty-eight other varieties and strains were tested and studied in comparison with Indiana Baltimore. Illinois Pride, Prariana, and Early Baltimore produced yields that were comparable to those of the Indiana Baltimore. Six strains of Rutgers were studied in this group and they all produced yields that were significantly lower than the Indiana Baltimore. This compared favorably with results secured during the previous three years. A number of other varieties were studied for the purpose of finding desirable characteristics for use in a breeding program.

Sixty-four selections and new hybrids were tested on a piece of soil which was badly infected with fusarium wilt. Practically all of these lines, although not immune to wilt, are able to produce a crop on soil which contains so much wilt that the regular Indiana Baltimore would be practically a total failure. Yields varied from 7 to 16 tons per acre with these various new lines, while the regular Indiana Baltimore produced only 3 tons. These plots were replicated three times and randomized.

The WS-129 wilt-resistant strain of Indiana Baltimore failed to yield as well as the regular strain in six tests throughout southern and central Indiana.

Nutrient solutions for tomatoes

Four nutrient solutions recommended for use in transplanting water were tested. The plots consisted of 64 plant rows which were replicated eight times. At no time during the growth of the plants could any difference be seen between the treatments themselves or the treatments and the checks, and there were no differences in yield under the conditions of this experiment.

Grades for tomato plants

Tentative grades for cannery tomato plants were established in cooperation with Indiana canners. These grades were used as a basis for experimental study. A Federal-State inspector was employed, and plants on the Southwestern Indiana Horticultural Experimental Farm were graded and studied. Copies of the standards have been submitted to the Bureau of Agricultural Economics for their suggestions.

More than 300 million plants are used in Indiana annually, most of which are grown outside the State. The application of standard grades in the purchase of tomato plants for the canning industry would greatly assist canners and farmers in securing well-grown, disease-free tomato plants of a uniform quality. Definite grades would also assist producers in their sale and distribution program.

Tomato quality studies

Two tomato fertilizer experiments were completed during 1940. No significant differences due to fertilizer treatment were obtained on Crosby and Brookston silt loams, but on Vigo silt loam marked increases were obtained. The best plot, which by November 4 had averaged 8.4 tons per acre more than the unfertilized plots, was one which received the following treatments: 300 pounds of sulfate of ammonia and 300 pounds of 50 per cent muriate of potash plowed under; 750 pounds of 20 per cent superphosphate and 150 pounds of muriate of potash applied in bands near the row; and 375 pounds of nitrate of soda side-dressed during the summer.

In three large spraying experiments and one large dusting test it was found that neither spraying nor dusting tomatoes was profitable in the very dry summer of 1940.

Sweet corn breeding

Canning trials of new double crosses of the Country Gentleman variety demonstrated the superiority of this type of hybrid over certain single crosses now in commercial use. Golden hybrid No. 1406, which has not yet been named, was produced commercially on a small scale for trial by canners and market gardeners. Canned samples of a new hybrid between Purdue 51 and a yellow selection from Purdue 39 x Illinois Country Gentleman inbred No. 9 had a flavor somewhat characteristic of the White parent and on the basis of field performance the parent line should be ready for distribution within a short time.

Several strains of Purdue 39 and Purdue 51 submitted by commercial growers were distinctly off-type and were disapproved for further use. The demand for new seed of Purdue 39 and Purdue 51 continues to exceed the supply and indicates the desire of commercial seedsmen to maintain the purity of their stocks, and that the use of Golden Cross Bantam is increasing in various parts of the country. Trial hybrids between 24 selections of Purdue 39 and four selections of Purdue 51 were produced for planting in 1941, together with 20 Purgold combinations, in an effort to develop new hybrids with larger ears and greater number of kernel rows.

European corn borer studies

Populations of the European corn borer increased markedly during the 1940 season. In 35 northeastern counties surveyed by the State Department of Conservation, the average increase in borer population was 383 per cent. The center of infestation occurred in Wells, Adams, Allen, Blackford and Jay Counties, and in these and surrounding counties the estimated damage for 1940 was $650,000. The notable damage and rapid build-up during the past few years may be attributed to the increased production of a two-generation borer.

With the development of a two-generation borer and the expansion of the egg-laying period from a 30- to a 90-day

period, weather is a less important factor in the control of the borer.

Studies on date of planting continue to indicate that the later plantings are relatively free of borers or borer damage as compared to early plantings. Also, as in previous experiments, it was shown that the height of the corn at the time the eggs were being laid is an important factor governing the freedom of late plantings from corn borer.

Reference: Fifty-fourth Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1941.

Illinois Report Deals with Tomatoes, Corn, Peas, Lima Beans and Asparagus

The work of the University of Illinois Agricultural Experiment Station in canning crops improvement has been in progress for many years and outstanding results have been achieved that are well known to canners in the middle west. The breeding of especially adapted varieties of tomatoes, production of inbred and hybrid Country Gentleman sweet corn, breeding of lima beans, studies of sweet corn fertilization and planting distances, investigation of methods of controlling pea aphid and other insect pests, and studies of the effect of cutting asparagus on yield are among the productive lines of canning crops research at the Illinois Station. Because of unavoidable delays in publication, the Station's report recently issued covers the experimental work of 1937-38. For this reason the following excerpts are briefer than would otherwise have been the case, since later progress on several projects has been reported in bulletin form and already brought to canners' attention.

Dusting corn ear worm

Results of extensive field tests of dusting materials used for control of corn ear worm carried on in cooperation with a commercial canning company have been disappointing. None of the materials tested gave sufficient control to be of any commercial value.

Maintaining sweet corn inbreds

Canners now have had sufficient experience with hybrids to realize that their chief value lies in the improved quality of the pack, in lowered canning costs because of more uniform maturity, and in the greater recovery of cut corn in a ton of unhusked ears.

The effect of climate presents a problem in maintaining inbred lines. Most of the sweet-corn hybrid seed is produced in the far west under irrigated conditions. Growing conditions there are ideal; and comparisons between inbred lines, even after growing a single year in the far west, show that numerous changes have occurred, some lines being affected but little while others show striking changes in appearance, and in some cases actually segregate. Since the Illinois inbreds have not been released sufficiently long, a test was made of Golden Cross Bantam (Purdue 39 x 51), the parents having been maintained two, three, and four years in the far west. The yields of Golden Cross Bantam become progressively poorer the longer the parents were maintained in the far west. Some of the far western seedsmen are now growing their inbreds in the middle west and make the crosses in the far west.

Effect of severity of cutting on asparagus yield

Although it has been generally conceded that severe cutting of young asparagus plantations is detrimental to succeeding crops, a few data bearing on this matter have been available, and many growers continue to practice severe cutting of their young plantations. To obtain definite data on the effects of this practice, a test was begun at the Cook County branch experiment station in 1926.

In general the results for 1937 are similar to those previously reported. The plots that were cut lightly or not at all the first two years after planting showed the highest total yields and greatest numbers of marketable spears in 1937, 11 years after the plants were set. Under the conditions of this experiment no cutting the first year is justifiable, but a light cutting of two weeks the second year after setting has not reduced the subsequent yields.

Good management of a young asparagus plantation that is located on soil of fairly high fertility would seem to call for the deferring of all harvesting until the second year after planting, and for limiting cutting to a period of two weeks the second year and four weeks the third year.

Cutting for eight weeks each year beginning with the fourth year is apparently a safe and satisfactory length of cutting season for a mature asparagus bed.

Methods of fertilizing asparagus

In view of the expanding asparagus acreage in the northern part of the State, an experiment was begun in 1931 to determine the response of this crop to various fertilizers and to determine the most effective time for their application. Plots were treated in quadruplicate with 1,000 pounds of fertilizer to the acre applied either in April or July or at both periods in divided applications.

The data indicate that although differences between treatments are not large, they are rather consistent from year to year. The response to nitrogen, however, was less marked than it has been in some previous years. A decrease in yield seems to be associated with a large application of super-phosphate.

The best yields of marketable shoots in 1937 were obtained where a 4-8-4 or a 6-8-4 fertilizer was applied in July after the close of the cutting season. When a 4-8-6 fertilizer was used, better results were obtained from the July application than from the application made in April, or when the material was divided and applied half in April and half in July.

Reference: Fifty-first Annual Report of the Illinois Agricultural Experiment Station, Urbana, for the year ended June 30, 1938.

Bulletin on Strawberry Production in Ohio

A new bulletin outlining methods of culture and management for strawberry growing in Ohio, based on experimental evidence and observations, has just been published by the Agricultural Experiment Station at Wooster. Among the subjects discussed are location of the site, varieties, obtaining and caring for the plants, soil preparation, fertilizers, harvesting, and preparation of the patch for the highest possible yield the next year after it has fruited at least once.

Reference: "Strawberry Production in Ohio." Bul. 626, Ohio Agricultural Experiment Station, Wooster.